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RHOPALOCERA COLLECTED AT LIGHT IN TEXAS[1]

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Increased use of induced light in the collection of nocturnal insects by entomologists has caused a proliferation of literature on diurnals collected at both visible and ultraviolet (UV) light, not only in the United States but in other parts of the world. Diurnal Lepidoptera have been taken at light in the UNITED STATES by Anderson (1960), Bouton (1962), Curtis (1962), Emmel (1962), Heitzman (1965, 1969), Kimball (1965), Mather (1959), Miller (1970), Oliver (1966), Phillips (1961), Thorne (1960), Wilkinson (1966), and Wood (1969); in MEXICO by Bouton (1962), Butler (1964), and Welling (1963); in CENTRAL AMERICA by Welling (1963); in INDIA by Best (1951, 1956), Donahue (1962), and Shull (1963, 1964); in EAST AFRICA by Sevastopulo (1948, 1955, 1958, 1964); and in the MEDITERRANEAN SEA near Pantellari Island by Sevastopulo (1948, 1964).

The purpose of this paper is to bring together recent published records of diurnal Lepidoptera taken at light in the United States and to add sixty-one species, representing 922 examples, from Texas. Except for one example, the additional species were collected by Perry A. Glick of Brownsville, Texas. The exception, a male *Vidius perigenes* found in the incandescent lighted foyer of a cafeteria in Brownsville, was collected by Kendall 9 November 1969 (Table 1).

Light sources at which diurnals have been taken include incandescent (60 and 150 watt vacuum light bulbs, street lights, "powerful lights", lighthouse beacons, door lights, flood lights, kerosene and gasoline type lanterns), fluorescent (15 and 20 watt tubes and lighted commercial signs), and ultraviolet (2

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TABLE 1

RHOPALOCERA TAKEN AT LIGHT IN THE UNITED STATES

HESPERIOIDEA	TEXAS Glick	TEXAS Others	OTHER STATES	USA TOTALS
Calpodes ethlis (Stoll)	6	-	-	6
Lerodea eufala (Edwards)	16	-	-	16
Lerodea dysaules Godman	1	-	-	1
Amblyscirtes nysa Edwards	-	-	1	1
Amblyscirtes celia celia Skinner	16	-	-	16
Euphyes vestris [*metacomet*] (Harris)	-	-	1	1
Ochlodes snowi (Edwards)	-	-	4	4
Atalopedes campestris (Boisduval)	11	-	12	23
Wallengrenia otho curassavica (Snellen)	36	-	1	37
Vidius perigenes (Godman)	-	1	-	1
Polites themistocles (Latreille)	-	-	2	2
Polites vibex praeceps (Scudder)	12	-	-	12
Hylephila phyleus (Drury)	5	-	-	5
Lerema accius (Smith)	53	-	-	53
Nastra julia (H. A. Freeman)	2	-	-	2
Pholisora catullus (Fabricius)	1	-	-	1
Pyrgus communis albescens Plotz	13	-	-	13

watt argon bulbs, 15 and 20 watt blacklight tubes, and 400 watt mercury vapor lamps). Glick utilized traps equipped with 15 watt UV blacklight tubes and others fitted with three 2 watt argon bulbs. Insect response was approximately the same for each type of light source. Glick's traps were located in Cameron and Hidalgo Counties of extreme south Texas, about 40 miles apart. They were operated 11 and 12 hours per day mainly, but not exclusively, from March through November 1960-1965. Rhopalocera were taken each month of the year except January. The greatest number of species (50) and examples (497) were collected in June and July.

Although an exhaustive search of the literature has not been made, there seems to be little evidence that diurnals are attracted to induced light in the same sense that nocturnals are. Possible exceptions are crepuscular species, although no conclusions are drawn. Evidence indicates most diurnals must be disturbed from their resting places before they appear at induced light. Kendall has experienced this many times in his rearing operations when handling freshly emerged Rhopalocera at night in the laboratory. It is almost impossible to place a specimen in a killing jar without some disturbance; consequently, specimens frequently escape. When this happens, some species will spiral to the ceiling and find their way into the overhead light fixture (three 100 watt bulbs). Other species may circle the floor lamp (three 100 watt bulbs), coming to rest on the lamp shade or actually on the bulb, or they may alight on the nearby furniture or floor. Still other examples will not go to the incandescent lights but will seek a shadowed spot in the laboratory where they rest until captured again, or they go to a window the following morning. Occasionally a specimen will alight on the ceiling. In each instance, if not disturbed again, the specimen will remain throughout the night. In certain other species, flight appears to be purely random. This is especially true of lycaenids which usually settle on the floor. Still another observation is that gravid Rhopalocera usually do not respond, as a whole, favorably under artificial light. *Caria ino melicerta* is one exception. Kendall has obtained eggs from this species under incandescent light. It is possible that most crepuscular species would oviposit under induced light.

The chance of getting certain diurnals at light is greatly increased if the light source is placed near their larval foodplants or in their natural habitats, especially during peak flight periods. Kendall observed several examples of *Callophrys miserabilis*

TABLE 1 (cont.)

	TEXAS Glick	TEXAS Others	OTHER STATES	USA TOTALS
Pyrgus philetas Edwards	2	-	-	2
Erynnis horatius (Scudder & Burgess)	-	-	1	1
Thorybes bathyllus (Smith)	-	-	4	4
Thorybes pylades (Scudder)	-	-	1	1
Urbanus proteus (Linnaeus)	2	-	-	2
Urbanus procne (Plotz)	9	-	-	9
Epargyreus clarus (Cramer)	-	-	1	1
PAPILIONOIDEA				
Papilio ornythion Boisduval	1	-	-	1
Pieris protodice protodice Boisduval & LeConte	6	-	1	7
Pieris rapae (Linnaeus)	-	-	7	7
Ascia monuste phileta (Fabricius)	3	-	-	3
Colias eurytheme eurytheme Boisduval	1	-	-	1
Phoebis sennae eubule (Linnaeus)	1	-	-	1
Phoebis agarithe maxima (Neumoegen)	1	-	-	1
Kricogonia castalia (Fabricius)[1]	59	-	-	59

[1]Includes 40 examples of form *lyside* (Latreille).

were taken in a trap operated beneath *Parkinsonia aculeata* L. the primary local larval foodplant for *C. miserabilis.*

On two occasions Kendall accompanied Glick on his light trap run. It was observed that one trap was situated beside a clump of *Celtis pallida* Torr. and *Celtis laevigata* Willd. It was therefore not surprising to find frequent examples of *Asterocampa* and *Libytheana* in this trap. *Ministrymon clytie* was collected exclusively in one area. Although its larval foodplant is unknown, the capture of 34 examples at the same location would indicate the foodplant was doubtless nearby and quite specific. The particular spot for this trap was not examined by Kendall but will be soon.

Disturbance of sleeping or resting diurnals may happen in many ways. Natural predators, such as wild and domestic cats, skunks, snakes, owls, and insects, can cause considerable disturbance around a light source. Skunks are frequent visitors at light traps and street lights where they forage on insects. One night about 2:00 a.m. CST, Mrs. Kendall was awakened by a noise outside the bedroom window. Upon investigating with a flashlight she found a small mantid holding a sphinx moth, *Pholus vitis,* which had come to feed on blossoms of cultivated flowers. The moth was unable to free itself and the mantid enjoyed a good meal. It is interesting to note that mantids also feed during the day. While collecting nocturnals around an extremely well lighted (fluorescent and incandescent) gasoline service station in San Antonio, Texas on June 3, 1962, the Kendalls observed a male *Anea andria* fly to a window of the glassed (three sides) service station office. It appeared to have come from Salado Creek wood about one hundred yards away. Typical of its daytime habits, it was frightened by the first movement to catch it. It darted out and over the rooftop into the darkness not to be seen again.

Another source of disturbance to resting diurnals is directly related to light trap operation. Various orders of insects other than Lepidoptera are attracted to UV light. Beetles and large moths often create considerable disturbance by striking vegetation at or near the light source. One night when the Kendalls were operating a 15 watt fluorescent blacklight, without trap, thirty-two male *Ecales imperalis* came to the light. They came in with such force that all were damaged from striking vegetation near the light; many were decapitated. Heavy insects often fall

TABLE 1 (cont.)

	TEXAS Glick	TEXAS Others	OTHER STATES	USA TOTALS
Eurema lisa Boisduval & LeConte	30	-	11+	41+
Eurema nise nelphe (R. Felder)	1	-	-	1
Nathalis iole Boisduval	6	-	-	6
Caria ino melicerta Schaus	9	5	-	14
Lasaia sessilis Schaus	1	-	-	1
Calephelis australis (Edwards)	1	-	-	1
Calephelis perditalis (Barnes & McDunnough)	2	-	-	2
Strymon liparops (LeConte)	-	-	1	1
Ministrymon clytie (Edwards)	34	-	-	34
Calycopis beon (Cramer)	33	-	-	33
Calycopis cecrops (Fabricius)	-	-	4	4
Tmolus azia (Hewitson)	1	-	-	1
Callophrys miserabilis (Clench)	5	-	-	5
Strymon melinus franki Field[2]	240	2	3	245
Strymon columella istapa (Reakirt)	6	-	-	6
Brephidium exilis (Boisduval)	1	-	-	1
Hemiargus ceraunus zachaeina (Butler & Druce)	8	-	-	8
Hemiargus isola alce (Edwards)	1	-	-	1

[2]Subspecies *franki*, Texas only.

short of the light, wander around for a time climbing on various vegetation, and eventually resume their journey to the light source. Such activity could easily disturb any resting diurnal.

Of the fifteen species of Hesperioidea taken by Glick, ten (161 examples) are grass feeders in the larval stage. The five non-grass feeders (24 examples) include *Calpodes ethlius* (6), *Pholisora catullus* (1), *Pyrgus communis albescens* (13), *Pyrgus philetas* (2), and *Urbanus proteus* (2). Glick also collected forty-five species of Papilionoidea representing 736 examples. Local larval foodplants are known for all of these except five: *Papilio ornythion* (1), *Ascia monuste phileta* (3), *Lasaia sessilis* (1), *Ministrymon clytie* (34), and *Chlosyne janais* (1). *P. ornythion* was taken in Glick's yard near two grapefruit trees. Citrus is reported to be its larval foodplant. Light traps were operated in close proximity to the known larval foodplants for most collected species.

Nine of the 82 species collected at light in the United States are represented by more than 20 examples each. Additional notes are given for each of these: *Strymon melinus* (245), multivoltine, collected in April (4), May (25), June (129), July (61), August (22), October (2), and December (2); it is widespread and common in south Texas; larvae eat buds, immature fruit, and juvenile leaves of many trees, shrubs, vines, and herbaceous plants. *Libytheana bachmanii* (197), multivoltine, collected in April (2), May (2), June (49), July (16), August (6), September (5), October (98), and November (19); it is abundant, often swarming and migrating by the millions; larvae eat only *Celtis;* in south Texas it seems to prefer *Celtis pallida* which is an abundant shrub throughout the lower Rio Grande Valley area. *Kricogonia castalia* (59), multivoltine, collected in April (1), May (47), June (8), July (1), and August (2); it is abundantly common in south Texas, often swarming and migrating by the millions; it flies only during the hottest and brightest part of the day, a sudden cloud shadow will cause it to seek lodging beneath a leaf; larvae eat *Porlieria angustifolia* (Engelm.) Gray, an abundant shrub in south Texas. *Lerema accius* (53), multivoltine, collected in February (1), May (2), June (6), July (28), and August (16); it is abundant at times along roadsides and the edge of wooded areas in south Texas; larvae feed on many species of broad-bladed grass. *Eurema lisa* (41), multivoltine, collected in May (4), June (11), July (8), August (2), September (12+), October (3), and November (1); it is common in south Texas; larvae feed on a number of low growing Leguminosae. *Wallen-*

TABLE 1 (cont.)

	TEXAS Glick	TEXAS Others	OTHER STATES	USA TOTALS
Everes comyntas (Godart)	-	-	1	1
Celastrina argiolus pseudargiolus (Boisduval & LeConte)	-	-	1	1
Libytheana bachmanii larvata (Strecker)	159	38	-	197
Anaea andria andria Scudder	1	-	-	1
Asterocampa celtis [*celtis*] (Boisduval & LeConte)	-	-	4	4
Asterocampa celtis antonia (Edwards)	2	-	-	2
Asterocampa leilia cocles (Lintner)	1	-	-	1
Asterocampa clyton texana (Skinner)	3	-	-	3
Asterocampa clyton louisa Stallings & Turner	7	-	-	7
Asterocampa clyton [*clyton*] (Boisduval & LeConte)	-	-	4	4
Vanessa atalanta (Linnaeus)	6	-	6	12
Vanessa virginiensis (Drury)	14	-	-	14
Vanessa cardui (Linnaeus)	1	-	1	2
Nymphalis vau-album j-album (Boisduval & LeConte)	-	-	2	2
Polygonia interrogationis (Fabricius)	1	-	2	3
Polygonia comma (Harris)	-	-	2	2
Chlosyne janais (Drury)	1	-	-	1

grenia otho (37), multivoltine, collected in February (1), April (6), June (5), July (3), August (6), September (7), October (6), and November (3); common in the lower Rio Grande Valley of Texas; the case-bearing larvae feed on various grasses. *Callophrys beon* (33), multivoltine, collected in April (1), May (3), June (20), July (5), August (3), and November (1); common throughout south Texas; apparently larvae feed on foliage of several different annuals including *Croton monanthogynus* Michx. on which Kendall has reared it several times. *Phyciodes phaon* (26), multivoltine, collected in June (3), July (16), August (1), and September (6); common over much of Texas but closely associated with its larval foodplant, *Phylia* (formerly known as *Lippia*). *Ministrymon clytie* (34), multivoltine, collected in May (4), June (5), July (6), August (16), September (2), and November (1); fairly common at times in Brownsville, Texas along the edge of wooded areas; larval foodplant unknown, but the insect is most likely closely associated with it.

Perhaps the most significant conclusions which may be drawn from these data are: Diurnal Lepidoptera taken at light is an indicator of species spatial and temporal distribution for a given area. In some instances, one may determine the period of peak emergence or abundance. Captures may indicate light source proximity to specific larval foodplants. Additional research is necessary to identify crepuscular species and determine the significance of this phenomenon.

Tabulated here are 82 species of Rhopalocera representing 1,044 specimens collected at induced light in 14 states. Of the examples taken, 87% was collected in Texas by Perry A. Glick. Temporal distribution shows most examples were collected in July and August (54%), while 11% was taken in May, 13% in August, and 12% in October. Species arrangement follows dos Passos (1964, 1969 & 1970).

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TABLE 1 (cont.)

	TEXAS Glick	TEXAS Others	OTHER STATES	USA TOTALS
Chlosyne lacinia adjutrix Scudder	11	-	-	11
Phyciodes tharos tharos (Drury)	17	-	1	18
Phyciodes texana texana (Edwards)	2	-	-	2
Phyciodes phaon (Edwards)	26	-	-	26
Phyciodes vesta (Edwards)	1	-	-	1
Speyeria diana (Cramer)	-	-	1	1
Speyeria cybele cybele (Fabricius)	-	-	3	3
Euptoieta claudia (Cramer)	1	-	-	1
Danaus plexippus plexippus (Linnaeus)	1	-	1	2
Danaus gilippus strigosus (Bates)	2	-	-	2
Lethe portlandia portlandia (Fabricius)	-	-	2	2
Euptychia gemma freemani (Stallings & Turner)	1	-	-	1
Euptychia hermes sosybius (Fabricius)	27	-	-	27
Cercyonis pegala [*pegala*] (Fabricius)	-	-	2	2
Cercyonis pegala nephele (Kirby)	-	-	1	1
Total Species ----------	60	4	32	82
Total Examples ----------	921	46	89	1,056

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